Underdiagnosis of asthma: is the doctor or the patient to blame? The DIMCA project

C P van Schayck, F M M A van der Heijden, G van den Boom, P R S Tirimanna, C L A van Herwaarden

Abstract

Background—It is important to diagnose asthma at an early stage as early treatment may improve the prognosis in the long term. However, many patients do not present at an early stage of the condition so the physician may have difficulty with the diagnosis. A study was therefore undertaken to compare the proportion of patients who underpresented their respiratory symptoms with the proportion of undiagnosed cases of asthma by the general practitioner (GP). A secondary aim was to investigate whether bad perception of dyspnoea by the patient was a determining factor in the underpresentation of asthma symptoms to the GP.

Methods—A random sample of 1155 adult subjects from the general population in the eastern part of the Netherlands was screened for respiratory symptoms and lung function and the results were compared with the numbers of asthma related consultations registered in the medical files of the GP. In subjects with reduced lung function the ability to perceive dyspnoea was investigated during a histamine provocation test in subjects who did and did not report their symptoms to their GP.

Results—Of the random sample of 1155 subjects 86% (7%) had objective airflow obstruction (forced expiratory volume in one second (FEV1) below the reference value corrected for age, length, and sex minus 1.64SD on two occasions) and had symptoms suggestive of asthma. Of these 86 subjects only 29 (37%) consulted the GP, which indicates underpresentation by 66% of patients. Of all subjects with objective airflow obstruction who presented to their GP with respiratory symptoms, 23 (7%) were recorded in the medical files as having asthma, indicating underdiagnosis by the GP in 21% of cases. Of the subjects with objective airflow obstruction who visited the GP with respiratory symptoms 6% had bad perception of dyspnoea compared with 26% of those who did not present to the GP in spite of airflow obstruction ($\chi^2 = 3.02, p = 0.08$).

Conclusions—Underpresentation to GPs of respiratory symptoms by asthmatic patients contributes significantly to the problem of underdiagnosis of asthma. Underdiagnosis by the GP seems to play a smaller role. Furthermore, there are indications that underpresentation of symptoms by the patient is at least partly explained by a worse perception of dyspnoea.

Keywords: asthma; underdiagnosis; underpresentation; general practice

There is still an increase in the morbidity and mortality of asthma which seems to apply to patients diagnosed as having asthma as well as to those in whom a diagnosis of asthma has not yet been made. Underdiagnosis and consequent undertreatment might be important in the increased morbidity and mortality of asthma. Early detection and treatment of asthma might improve the long term prognosis of these patients and this secondary prevention may also prevent irreversible loss of function. It is not clear whether the physician or the patient is to blame: is underdiagnosis of asthma caused by the physician who does not adequately interpret the symptoms presented to him (or her) or is it caused by the patient who does not present his or her symptoms to the physician? In the latter case it is not clear why a patient does not present his or her symptoms to the GP. Is this caused by poor perception of the symptom of dyspnoea in particular?

The primary aim of this study was to compare the numbers of cases of underpresentation of respiratory symptoms by the patient with underdiagnosis by the GP. A secondary aim was to investigate whether the perception of dyspnoea by patients plays a part in the possible underpresentation of symptoms of asthma to the GP.

Methods

STUDY DESIGN

This study is part of a larger study, the DIMCA project (early Detection, Intervention and Monitoring of Asthma and COPD) carried out by the Department of General Practice and Social Medicine of the University of Nijmegen. The project has been ongoing since 1991 and its aim is the early detection, monitoring and, if necessary, early treatment of patients with asthma and chronic obstructive pulmonary disease (COPD).

PATIENTS

A random sample of 1155 subjects aged 25–70 was selected from 10 urban and rural general practices in the eastern part of the Netherlands. In the Netherlands all subjects in the general population are registered in the files of
a GP. There was no recruitment bias during the
selection procedure (described in detail elsewhere13 see also table 1). These 1155
subjects went through an extensive screening
programme which included several measure-
ments of forced expiratory volume in one sec-
ond (FEV1) and a comprehensive
programme which included several measure-
ments of forced expiratory volume in one sec-
ond (FEV1) and a comprehensive
questionnaire13 15 which included a question
on whether they had ever presented with respi-
atory problems such as wheezing, coughing,
or dyspnoea to the GP. Special attention was
paid to the number of subjects with objective
airway obstruction and symptoms suggestive of
asthma (wheezing, recurrent coughing, or dys-
pnoea) to investigate further underpresenta-
tion and underdiagnosis in this group of higher
risk subjects. FEV1 was measured twice in a
four month period under standard
conditions.14 When the FEV1 was less than the
reference value (based on age, height, and sex
minus 1.64SD) on both occasions it was
considered to deviate objectively from
normal.14

The medical files at the surgeries of the GPs
were analysed for asthma related consultations.
All files were checked if either asthma related
complaints and symptoms, or prescribed
asthma drugs, or both, were present. All
asthma related consultations were scored.
Consultations in which an infection of the
upper airways or pharyngitis had been diag-
nosed were not counted as asthma related con-
sultations. The analysis was limited to five years
before the screening date. While the analysis of
the GP files only included the last five years, the
question whether the patient had ever pre-
sented with symptoms covered a much longer
period. To validate the method used, one quar-
ter of the subjects were chosen at random and
were further checked by analysing the com-
plete patient history from birth (as far as
the complete file was available) for the presence of
asthma related consultations. In no case had a
diagnostic misclassification been made.

**PERCEPTION OF DYSPNOEA**

For the second question of the study a random
sample of subjects with objective lung function
was selected as above. Of the 86 subjects with
reduced lung function, 47 were further investi-
gated to determine their ability to perceive dys-
pnoea by assessing the change in Borg score
during a histamine provocation test carried out
using the method described by Brand et al.9

The PC20 histamine was determined in a lung
function laboratory in subjects with a baseline
FEV1 of more than one litre and more than
50% of the reference value. After saline
solution histamine was administered at five
minute intervals in doses ranging from 0.03 to
32 mg/ml and the subjects were asked to report
dyspnoea 30 seconds after inhalation, immediately preceding measurement of the
FEV1. The inhalation was stopped when the
baseline FEV1 had decreased by 20% or when
a dose of 32 mg/ml had been reached. The
degree of dyspnoea was scored on the Borg
scale, a 12 point ordinal scale ranging from 0
(no dyspnoea) and 0.5 (very, very slight
dyspnoea) to 10 (maximally dyspnoea).9 The
FEV1 was measured and recorded in readings
accurate to 10 ml. The slightest decrease or
increase therefore corresponded with a change
in FEV1, of at least 10 ml. After the measure-
ments the subjects were classified into two
groups: “good perceivers” in whom a decrease
in FEV1 was accompanied by an increase in the
Borg score and “poor perceivers” in whom
there was a 20% decrease in FEV1, or an
observed decrease in FEV1, after the last
doubling dose of 32 mg/ml histamine which
was not accompanied by any increase in the
Borg score.9 It was then determined whether or
not patients in the two groups with reduced
lung function had consulted the GP with
asthma related symptoms.

**Results**

Of the random sample of 1155 subjects, 86 had
objective airflow obstruction as well as symp-
toms suggestive of asthma. The number of
subjects with symptoms suggestive of asthma
in the GP files and the number who had
consulted the GP with symptoms suggestive of
asthma are shown in table 2. Of the 86 subjects
only 29 (34%) had ever presented their symp-
toms to the GP; thus, 66% of the subjects had
not consulted their GP even though they had
objective airflow obstruction. Of the 29 sub-
jects who had consulted their GP, however, six
(21%) were not diagnosed as having asthma by
the GP.

Forty seven subjects from the general popu-
lation sample with decreased FEV1 were inves-
tigated as to their ability to perceive dyspnoea
by means of a histamine provocation test and
Borg score measurements (table 3). Of the 16
subjects who had presented to the GP, 15
(94%) were “good perceivers” and one (6%)
categorised as a “poor perceiver”. Of the
31 subjects who had not presented to the GP,
23 (74%) were categorised as “good perceiv-

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**Table 1** | **Patient characteristics**
---|---
| **Variable** | **Participants** | **Refusal** |
| | | |
| Mean (SD) FEV1 (% predicted) | 96.4 (14.6) | 96.1 (17.5) |
| FEV1 reversibility (%)‡ | 3.3 (4.1) | |
| Sex (% female) | 55.3 | 61.8 |
| Mean (SD) age (years) | 43.2 (11.8) | 45.2 (13.4) |
| Childhood eczema (%)§ | 11.4 | 6.1 |
| Current smokers (%) | 37 | 39 |
| Ever smokers (%) | 70 | 71 |
| FEV1 = forced expiratory volume in one second.
*Subjects (n = 1155) who participated in the study. Initially
1988 were sampled, 239 were excluded (known asthma or
COPD, congestive heart failure, lung diseases other than asthma
or COPD, life expectancy less than 11 years) and 594 refused or
did not respond.
†Random sample of subjects (34 of 594) who refused to partici-
pate at first but eventually agreed to be screened at home.
‡Reversibility in FEV1 at 15 minutes after inhalation of 800 µg
salbutamol; not assessed in subjects screened at home (as this
was an important reason for refusing to participate).
§Percentage of affirmative answers to questionnaire question:
“Did you ever experience eczema in childhood?”

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**Table 2** | **Subjects with objective airflow obstruction and symptoms suggestive of asthma selected from the general population (n = 86): underpresentation by patients and underdiagnosis by general practitioners (GPs)**
---|---|---
| **Variable** | **Yes** | **No** |
| Presented symptoms to GP | 29 (34%) | 57 (66%) |
| Asthma related consultation in file at GP surgery | 23 (29%) | 6 (21%) |
Table 3 A random sample of 47 subjects with obstructive airflow obstruction selected from the general population: relation between presentation of symptoms to the general practitioner (GP) and the perception of dyspnoea

<table>
<thead>
<tr>
<th>Perception</th>
<th>Poor</th>
<th>Good</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presented symptoms to GP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1 (6%)</td>
<td>15 (94%)</td>
<td>16 (34%)</td>
</tr>
<tr>
<td>No</td>
<td>8 (26%)</td>
<td>23 (74%)</td>
<td>31 (66%)</td>
</tr>
<tr>
<td>Total</td>
<td>9 (19%)</td>
<td>38 (81%)</td>
<td>47 (100%)</td>
</tr>
</tbody>
</table>

There is considerable evidence that dyspnoea has a pronounced effect on quality of life. We therefore assumed that dyspnoea is likely to be the symptom which is most likely to cause patients to consult their GP. This paper therefore does not focus on the perception of asthma but, rather, is limited to the perception of dyspnoea. The objective parameter most related to dyspnoea is the reduction in FEV₁.

We have investigated whether the ability to perceive airway obstruction determines whether or not a patient visits his or her GP with concomitant airway symptoms (dyspnoea). It should be pointed out that the time at which the question concerning the presentation of symptoms was answered and the time at which the perception of dyspnoea was measured were not synchronous, and this may have confounded the results. Another problem is that the presence of airway obstruction does not always result in the presence of bronchial symptoms. There are even indications that patients with more severe asthma have a reduced perception of dyspnoea.

This study has shown that the perception of dyspnoea seems to determine, at least in part, the presentation to the GP with symptoms. Of the subjects with bronchial obstruction who did visit the GP with airway symptoms, 6% had a poor perception of dyspnoea while, of the subjects who did not visit the GP in spite of bronchial obstruction, the percentage with a poor perception of dyspnoea was more than four times higher at 26%. Because of the small number of patients studied, these figures are not significant but, when subjects with more severe airway obstruction were considered, the tendency was clearly confirmed. It could be argued that, because a poor perception of dyspnoea is probably a cause of underpresentation by the patients, neither the physician nor the patient is to blame for the underdiagnosis of asthma in the general population.

One limitation of this study was the relatively small number of subjects with reduced lung function in the general population with only 86 of 1155 subjects having clear reduced lung function.

One of the factors in determining the role of perception of airway obstruction in the underpresentation of respiratory symptoms is the ability to influence this perception positively. If perception plays a large part in the presentation of symptoms, its improvement might logically result in better presentation of symptoms which could contribute to an early diagnosis of asthma. It is important to know the level at which perception could possibly be influenced. If the process of perceiving takes place at the cellular level, a positive influence on the ability to perceive is attributed to corticosteroids. Roisman et al claim that perception by asthmatic subjects is related to the presence of eosinophilic inflammatory cells and epithelial damage in the airways. They conclude that corticosteroids are associated with improvement in the perception of bradykinin induced bronchoconstriction, a mediator produced endogenously in asthma. However, this would not be helpful for subjects who are not yet diagnosed and who therefore would not be treated with steroids. In case of a more psychological or behavioural foundation to percep-
Underdiagnosis of asthma

In summary, underpresentation of respiratory symptoms by asthmatic patients plays probably the most important role in the under-diagnosis of this disease. Furthermore, there are indications that underpresentation of symptoms by patients is caused by a decreased perception of dyspnoea. Future research should focus on possible methods of improving the perception and awareness of patients with symptoms of asthma.

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